Effects of Child Abuse and Neglect on Brain Development

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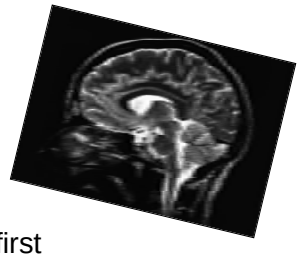
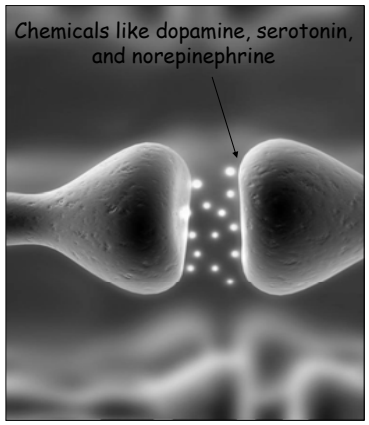
Brain development



- Primitive structures develop first
  survival needs: heartbeat, breathing
- Humans born most neurologically incomplete of any animal
- Most brain growth is after birth
- 90% of brain growth is in the first three years

Neurotransmitters

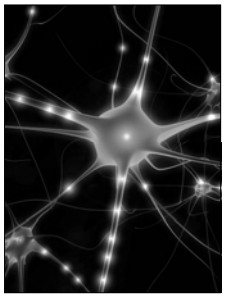


Nerve A

Nerve B

Infant brain development

- Born with 100 billion brain cells
- Each makes up to 15,000 connections
- By age three:
  - 1000 trillion connections
  - twice as many as an adult

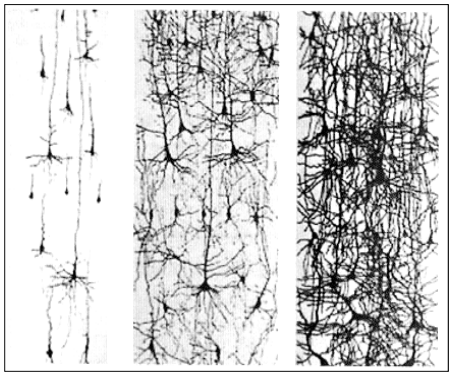


Brain development

- Makes networks
- Experience shapes the pathways
- Pruning: “use it or lose it”
- Brain connections for optimal development occur from:
  - nurturing
  - stimulation
  - predictable care

Cells multiply and make connections

brain cells



newborn 3 months 2 years

Brain Development: “windows of opportunity”

Critical periods:

- Vision
- Hearing
- Acquiring first language
- Attachment

Sensitive periods:

- Learning second language
- Playing musical instrument
- Social skills
- Reading
- Ability to see color

Critical and sensitive periods

Task	0-3 mo	3 mo-3 yrs	3-11 yrs	11-18 yrs	18-adult
Vision					
Hearing					
Social Skills					
Language					

Nurturing development

Repeated use develops brain connections

- frequent, regular, predictable
- occur in warm supportive relationship
- associated with fun, excitement, humor, comfort
- involves several senses
- child's interests

Brain grows to fit environment it experiences

Long-term benefits

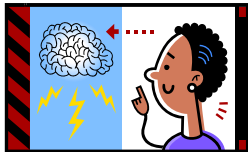
- More nurturing caregiving = better stress response in later life
  - Without it, imbalance in brain chemicals
  - Less able to calm self; intense reaction
- Children who attend preschool:
  - 52% less maltreatment
  - greatest difference seen when 10-17 y.o.

NIH, 2003

Brain development in teens

1. Doesn't function like adult brain
   - Part involved in judgment / calming emotions last to develop
   - Thrill seeking: releases dopamine
2. Need more sleep: 9 hours 15 min.
   - Biological clock set later
   - More sleep = better grades
3. Less able to recognize facial expressions
4. Myelin coating: "insulation" of nerves not complete

Brain development in adolescents



Incomplete structure and chemistry

- Prefrontal cortex: last part to develop part involved in judgment and calming emotions
- thrill-seeking, risk-taking: releases dopamine (occurs in other animals, too)

Brownlee, 1999; Spear, 2000; Pellis, 2004

Brain development in adolescents

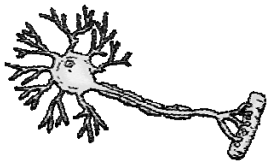
Sleep / arousal differences

- Need more sleep
  - average 9 hours, 15 minutes
  - increased daytime sleepiness
- Biological clock set later
  - biological tendency to stay up later at night and wake up later in the morning
- More sleep = better grades
  - REM sleep is needed for memory

Brain development in adolescents

- Often not able to accurately recognize facial expressions
- So, have more difficulty interpreting social situations

Brain development in adolescents



One of last things to happen in is myelinating nerve cells in brain

- Fatty substance that coats nerve cells and acts like insulation on electric cord
- Allows electrical impulses to travel more quickly and efficiently
- Last part to myelinate is part that regulates judgment, emotion and impulsivity
- Not complete until early twenties
- Happens earlier in girls than boys

Puberty

Sudden activation of hormones affects drives, motivation, emotions (occurs early)

+

Slow, gradual emergence of cognitive control (occurs late)

=

Time of vulnerability

Turn on turbo charger, but with an unskilled driver

The teen's undeveloped brain…

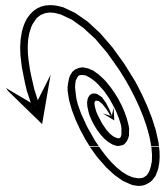
The News & Observer: Tuesday, January 29, 2008

Social influences, too: Can lead to spiral of negative events

- Greater freedom with bedtime
- More light / stimulating activities = difficulty falling asleep
- Major circadian shift on weekends/vacations

Social context amplifies the biologic change

Spiral of negative events



- Lapses, performance deficits
- Irritability, emotional lability
- Motivational changes, attention problems
- Effects on learning / memory
- Increased use of caffeine / stimulants

Social context amplifies the biologic change

Emotional Intelligence (EQ)

20% success in life based on IQ
80% success in life based on EQ

- Motivate oneself
- Face frustrations
- Control impulses and delay gratification
- Regulate one's moods and keep distress from overwhelming the ability to think
- Empathize with others

Effects of trauma, stress and maltreatment

Childhood trauma

- Highly prevalent
- Elevates suicide risk
- Increases risk of mental disorders

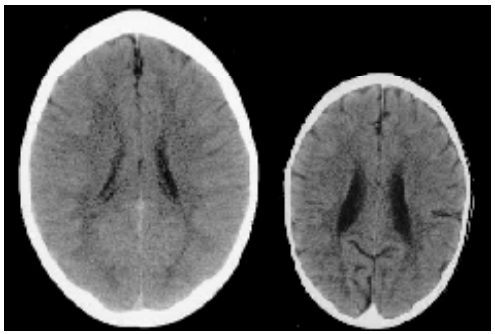
- Affects developing brain with potentially lifelong changes in:
  - physical stress response system
  - cognitive development

Childhood trauma

- Deformities / abnormalities of brain
  - Smaller brain volume = lower IQ
  - Smaller corpus collosum
- Changes in biochemical functioning
  - Stress response dysregulation
  - Vulnerable to subsequent traumas

Healthy vs. Neglected Brain

Three year old child



Healthy child

Severely neglected child, kept in cage first 3 years

Source: Perry, B. & Pollard, D. Altered brain development following global neglect in early childhood. *Society for Neuroscience: Proceedings from Annual Meeting*, New Orleans, 1997.

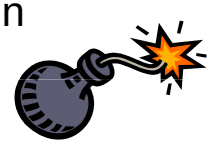
Effects of maltreatment in pre-school children

Stress and trauma damage the brain

Neglect
- Less brain activity
- Slower in developing language, memory and reasoning

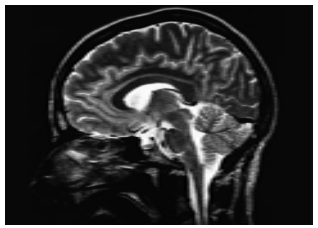
Abuse or violence
- Smaller brain volume = lower IQ
- Alters brain chemistry: becomes "hardwired" for danger

Effects of maltreatment in school-age children



Physical abuse
- social problems with peers, aggression, delinquency, poor academic performance

Neglect
- significant academic problems, drop outs, substance abuse, few social problems



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Rates of Occurrence

- 12%-22% of children suffer from psychiatric disorders
- 35%-60% children in foster care exhibit problems needing intervention
- Only 18% of those children receive mental health services

Kids in foster care have mental disorders
3X rate in general population

- Maltreatment worsens existing disorders
- Kids with disorders become targets
- Abuse/neglect cause brain damage/dysfunction

Despite effective treatment, few get it

Post Traumatic Stress Disorder PTSD

- 1/3 children 6-8 yrs. old in foster care
- Sexually abused children 6+ yrs old - 100%
- Children continuously exposed to danger, who witness, experience violence
  - stress hormones stay “on”
  - results in brain damage / changes in chemistry

Conduct disorder

Disorder of maltreatment: <u>trauma-induced</u>

Deformities / abnormalities of the brain
- head injuries
- smaller brain volume = lower IQ
- smaller corpus collosum

Changes in biochemistry

Medication + therapy = improves long-term outcomes

Resiliency

- ★ Active process of struggle and growth in response to crisis and challenge
- ★ Offers second chances
- ★ Close relationship early in life is key to success

The Hope…

Most high-risk youths with serious problems in adolescence, were described by 30 as "*resilient*."

Always - had one adult who cared about them.